PROGRAM facts

U.S. DEPARTMENT OF ENERGY
NATIONAL ENERGY TECHNOLOGY LABORATORY

Fuels and Energy Efficiency

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EXPLORATION, PRODUCTION AND TRANSPORT OF PETROLEUM CRUDE

FY2002 Expanded Activity

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The goal of the Clean Liquid Fuels Program is to promote the development and deployment of technologies that produce clean, high performance fuels from a variety of secure energy resources. There are five major elements: Exploration, Production and Transport of Petroleum Crude; Petroleum Environmental Solutions; Ultra-Clean Fuels; Future Fuels; and Infrastructure Reliability and Product Integrity. The Exploration, Production and Transport of Petroleum Crude program element is discussed below.

Background

During the last 10 years, the U.S. petroleum industry has changed greatly. Traditional major oil companies have divested much of their older onshore U.S. resources. With the exception of Alaska and offshore Gulf Coast, most U.S. reservoirs no longer meet the risk/reward/target size criteria for most majors. Existing oil fields are becoming depleted and cost more to operate.

Research in the exploration and production area has also changed. With the downsizing and consolidation of major oil companies, there has been a declining number of R&D and engineering/refining groups in the U.S. Those that are still doing research tend to fund short-term projects with anticipated immediate payoffs.

For the year 2000 U.S. demand for liquid fuels totaled 20,528 thousand barrels per day (MB/D), of which only 9,525 MB/D was from domestic production. By 2020, U.S. demand will increase to total 25,090 MB/D (including conservation and more efficient engines) while U.S. production is anticipated to decline to 9,070 MB/D.

The Exploration, Production and Transport of Petroleum Crude program element is designed to provide low-impact, high-return exploration and development technologies, along with high-tech tools enabling us to gather geologic data from deep under the surface. The program provides for exploratory slim-hole drilling without roads, minimal surface disturbance (footprint) and small (tankable) amounts of drilling, completion or stimulation fluids to encourage production, advanced production techniques using multi-well pads and safer transport of crude oil to the refinery gate.

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Description

This program component is made up of five technology areas.

Exploration/Development (E&D) – Advanced Diagnostics and Imaging Systems

Locating new oil and gas resources and delineating older fields, including zones behind pipe are critical to maintaining U.S. oil production. The technology goals in this component include efforts to:

- Improve seismic and other geophysical acquisition, processing and interpretation technologies to provide increased resolution and accuracy, with emphasis of single-well, crosswell, and novel surface methods;
- Increase the understanding and measurement of rock/fluid properties and interaction; and
- Develop and demonstrate techniques to better image low permeability and naturally fractured reservoirs to improve production.

Advanced Drilling, Completion and Stimulation / Operations

Access to oil and gas requires drilling wells, completing and often stimulating them to achieve commercial levels of oil and gas production. The technology goals in this component include efforts to:

- Reduce drilling costs;
- Reduce operating costs;
- Improve production rates; and
- Increase the rate of penetration.

Production – Reservoir Efficiency Processes

Primary production from an oil reservoir is often less than 30% of the original oil in place. Waterflooding may double primary production but economic limits of primary and secondary production often leave as much as 70% of the original oil in place. In the U.S. this resource is 351 billion barrels, of which 45% is in reservoirs already abandoned. The target for advanced and improved oil recovery technologies is about 260 billion barrels. The technology goals in this component include efforts to:

- Make available new technologies and more efficient existing recovery processes that will stabilize domestic oil recovery;
- Increase the rate of enhanced oil production (as defined and tracked by the Oil & Gas Journal) by at least 10 percent; and
- Stabilize the oil and gas well abandonment rate.

Production – Reservoir Life Extension

Declining oil and gas production in older fields is falling to independent companies who usually use less advanced technology than most of the major companies that previously operated the field. This technology area helps to extend the productive life of the field before wells are plugged and the resource is permanently abandoned. The technology goals in this component include efforts to:

- Make available to industry, improved and new technologies helping to stabilize domestic oil recovery at current rates;
- Stabilize the abandonment rates of marginal oil and gas wells at current rates; and
- Maximize oil and gas extraction through focused research and field-testing of reservoir life extension technologies and technology transfer.

Transportation – Pipeline Transport of Crude Oil

The U.S. crude oil collection system connecting individual wells, tank batteries and leases to major collection lines leading to tank farms at refineries is old. Major companies and refiners have divested themselves of much of their previous pipeline system in older oil producing areas. Lower volumes, increased urbanization, continuous chemical deterioration of steel pipe, lack of investment for replacement (due to low oil prices and cyclical oil prices) have increased the potential for leaks and environmental contamination. This technology area is new and its goals include efforts to:

- Support development and operation of reliable and safe crude oil collection and transport systems through support of advanced materials engineering and sensor/detection systems; and
- Work with industrial associations to provide focused technology workshops, information resource centers and computer/internet-based information.

Exploration, Production and Transport of Petroleum Crude

FY2002 Expanded Activity

Developing advanced exploration, production and transport technologies

Benefits

This program element will develop advanced exploration, production and transport technologies that:

- promote reliable energy supplies at reasonable prices;
- support the efficient and sustainable use of domestic energy resources;
- preserve the environment;
- enhance the value of Federal lands;
- foster the use of new technology through a nationwide technology transfer network; and
- contribute to continued U.S. global technology leadership.